USC University of Southern California

USC Viterbi

Ming Hsieh Department of Electrical Engineering

Munushian Visiting Seminar Series

KEYNOTE LECTURE

Dr. William Phillips

Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland

Nobel Laureate, Physics 1997

"Quantum Information: a scientific and technological revolution for the 21st century"

Friday, April 13, 2018
2:00 - 3:30 pm, GER 124 Auditorium
Reception on patio at 3:30pm

Abstract: Two of the great scientific and technical revolutions of the 20th century were the discovery of the quantum nature of the submicroscopic world, and the advent of information science and engineering. Both of these have had a profound effect not only on our daily lives but on our worldview. Now, at the beginning of the 21st century, we see a marriage of quantum mechanics and information science in a new revolution: quantum information. Quantum computation and quantum communication are two aspects of this revolution. The first is highly speculative: a new paradigm more different from today's digital computers than those computers are from the ancient abacus. The second is already a reality, providing information transmission whose security is guaranteed by the laws of physics. The JQI/NIST Laser Cooling and Trapping Group is studying the use of single, ultracold atoms as quantum bits, or qubits, for quantum information processing.

Biosketch: William D. Phillips was born in 1948, in Wilkes-Barre PA, and attended public primary and secondary schools in Pennsylvania. He received a B.S. in Physics from Juniata College in 1970 and a Ph.D. from MIT in 1976. After two years as a Chaim Weizmann postdoctoral fellow at MIT, he joined the staff of the National Institute of Standards and Technology (then the National Bureau of Standards) in 1978. He is currently leader of the Laser Cooling and Trapping Group in the Quantum Measurement Division of NIST's Physical Measurement Laboratory, and a Distinguished University Professor at the University of Maryland. He is a Fellow of the Joint Quantum Institute, a cooperative research organization of NIST and the University of Maryland that is devoted to the study of quantum coherent phenomena. At the JQI he is the co-director of an NSF-funded Physics Frontier Center focusing on quantum phenomena that span different subfields of physics.

The research group led by Dr. Phillips at NIST has been responsible for developing some of the main techniques now used for laser-cooling and cold-atom experiments in laboratories around the world, including the deceleration of atomic beams, magnetic trapping of atoms, the storage and manipulation of cold atoms with optical lattices, and the coherent manipulation of Bose-Einstein condensates. In 1988 the NIST group discovered that laser cooling could reach temperatures much lower than had been predicted by theory, a result that led to a new understanding of laser cooling and contributed to many of the subsequent developments in cold atomic gases. Early achievements included reaching laser-cooling temperatures within a millionth of a degree of Absolute Zero. Today, the group pursues research in laser cooling and trapping; Bose-Einstein condensation; atom optics; collisions of cold atoms; quantum information processing; cold atoms in optical lattices; production and transmission of non-classical light; and the study of cold-atom analogs to condensed matter systems. Phillips and colleagues demonstrated the first "atomic fountain" clock as proposed by Zacharias. Such clocks, as realized in other laboratories, have become the primary time standards for world timekeeping.

Dr. Phillips is a fellow of the American Physical Society and the American Academy of Arts and Sciences. He is a Fellow and Honorary Member of the Optical Society of America, a member of the National Academy of Sciences and the Pontifical Academy of Sciences, and a corresponding member of the Mexican Academy of Sciences. He is the recipient of the Gold Medal of the U. S. Department of Commerce (1993), the Michelson Medal of the Franklin Institute (1996), the Schawlow Prize of the American Physical Society (1998), and the Service to America Medal, Career Achievement Award 2006. In 1997, Dr. Phillips shared the Nobel Prize in Physics "for development of methods to cool and trap atoms with laser light."